Plasma-Liquid Interactions: Status of Modeling Issues

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Status of Plasma-Liquid Interactions

1. Effects of Plasma Instabilities

- Modeling energy and particle transport in SOL
- Splashing mechanisms
- Shielding effects

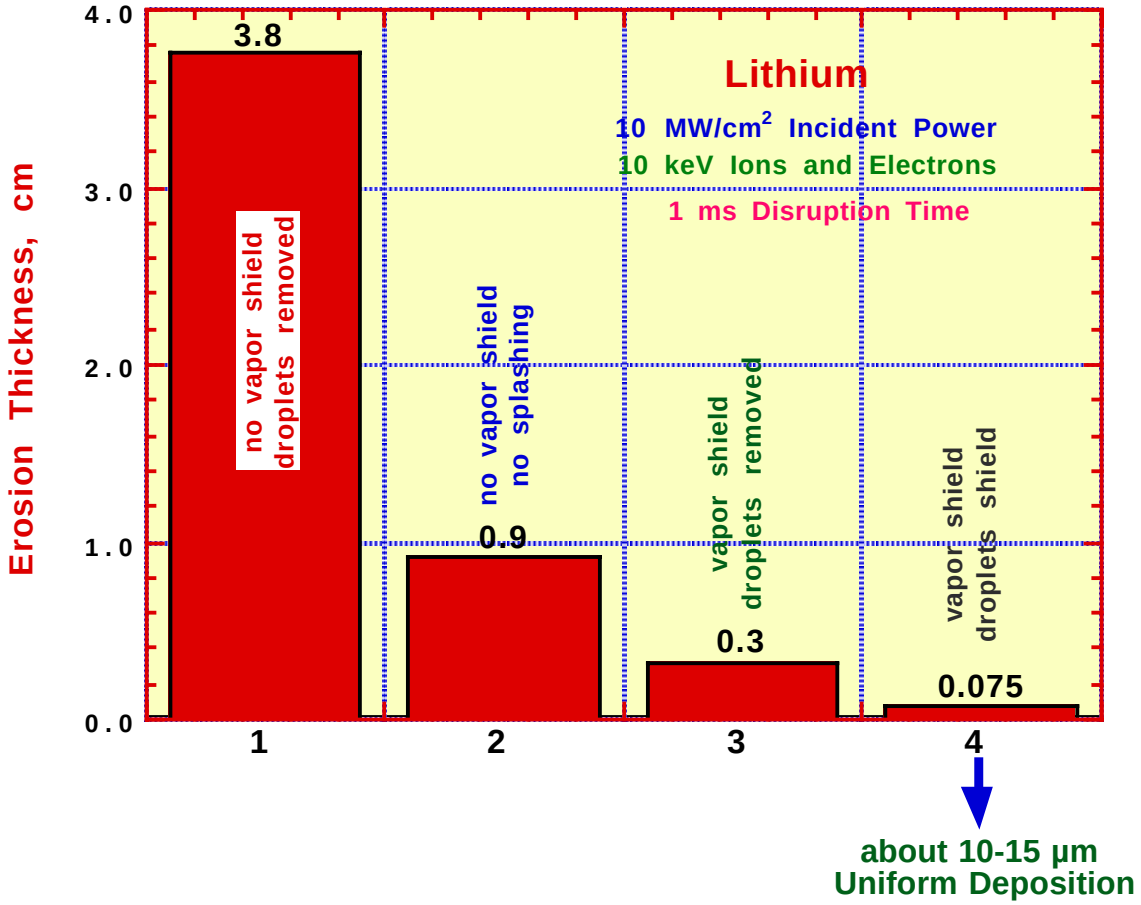
2. Assessment of D-T/He Pumping & Removal

- Self-consistent 2-D modeling of particle transport
- Liquid enhanced He pumping

3. Enhanced Sputtering Effects in liquids

- Proposed mechanisms
- Model development

HEIGHTS Analysis of Total Erosion Thickness of Lithium Divertor during a Disruption



Helium Pumping by Liquid Metals

- **Need He diffusion coefficient < 10^{-4} cm^2/s for reasonable liquid velocities. Recent studies indicate this may be the case.**
- **Helium penetration depth is only several monolayers!. NO Enhancement from internal flows!**
- **Need more data on He diffusion & trapping.**
- **D-T are completely pumped by flowing Li!**
- **Need to study synergistic effects in moving liquids?**
- **Bubbles formation → more likely WILL trap He!**
- **Bubbles bursting & Splashing → will de-trap He.**

Sputtering of Liquid Metals

- **Previous Russian data of He & D-T sputtering of liquid Ga clearly demonstrated that enhanced sputtering is due to bubble splashing.**

- **Enhanced sputtering erosion of liquids in US facilities (PISCES + U of I) indicates formation of bubbles and splashing! Makes the most sense.**

- **Need more data on He & D-T sputtering of Liquid Li → work done in PISCES & U of I is important. However, TIME DEPENDENT data is needed!**

- **Macroscopic sputtering due to bubbles bursting & Splashing → can be very serious issue of using liquid metals. Need to study macroscopic particles in SOL.**